

Corn Rootworms Get Juiced

Corn rootworms account for more pesticide use on row crops than any other insect pest in the United States.

Farmers apply pesticides, often as a preventive measure, to between 30 and 40 million acres annually. The insect costs corn farmers about \$1 billion a year in control measures and lost crops.

Now, Agricultural Research Service scientists from two laboratories at the Beltsville (Maryland) Agricultural Research Center have concocted a mix that turns the insects' gluttony against them. The new potion combines a red dye—proven safe for people and animals but deadly to insects—with the juice from a bitter, mutant watermelon.

While the bitter watermelon juice would gag most human palates, "it tastes like a hot fudge sundae to rootworms," says Albert DeMilo, who is now retired from the ARS Insect Chemical Ecology Laboratory. "The insects gorge on it, taking in plenty of the deadly red dye at the same time."

DeMilo, former postdoctoral fellow Chang-Joo Lee, and Robert Schroder, an entomologist with the ARS Insect Biocontrol Laboratory, identified the watermelon ingredient—cucurbitacin E-glycoside—that rings the rootworm's internal dinner bell. Now they have developed a process for extracting the juice, which is also a perfect solvent for the lethal dye, DeMilo says. When the formulated juice-dye mix is sprayed, it covers all the areas on the corn plants where the adult rootworm beetles hang out.

Farmers normally apply pesticides to the soil to kill the larvae, says Schroder. But these pesticides can pollute groundwater and surface streams. By contrast, the watermelon-dye combo zeros in on the adult stage of the insect and helps to break the

reproductive cycle so next year's population is lower. And it's safe.

The dye, phloxine B, is approved by the Food and Drug Administration as D&C Red #28 for use in drugs and cosmetics. It's also in the registration process for controlling fruit flies.

Sunlight activates the dye inside the insects, where it forms a potent oxidizing agent that attacks their tissues, DeMilo explains. It doesn't take long before they die. [For more on dye as an insecticide, see "Red Dye, Updated Traps," *Agricultural Research*, January 1996, p. 20.]

The new potion held its own against a promising bait-pesticide combo called SLAM that was developed by industry and ARS researchers in Brookings, South Dakota. SLAM is expected to cut the quantity of pesticide used for corn rootworm control by more than 90 percent. [See "Corn Belt Growers Give Areawide IPM a Try," *Agricultural Research*, October 1997, p. 5.] But it's good to have a backup, says

Schroder, because insects are notable for developing pesticide resistance.

In a preliminary field test at the Brookings laboratory last summer, the watermelon-dye combo actually killed 25 percent more rootworms than SLAM on the first day of application and equaled SLAM's kill rate after 4 days. A larger field test is planned for this summer.

DeMilo, Schroder, and Lee applied for a patent on the watermelon-dye combo. PhotoDye International of Baltimore, Maryland, has signed a cooperative research and development agreement with ARS, giving the company right of first refusal to license the patent. Other companies have also expressed interest, Schroder says.—By **Judy McBride**, ARS.

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Corn rootworm larva (about five times actual size).